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THE PLACE OF THE SUSSEX MAN

BY FREDERICK ARTHUR HODGE

MUCH interest has recently been manifested in the discovery, by Mr. Charles Dawson, of part of the skull and mandible of an ancient man, near Pilt Down Common, Sussex, England. Workmen first found an object resembling a cocoanut, which curiosity led them to break in pieces, and, being unable to solve the mystery, they cast the pieces aside. Later a number of worked flints were found and laid out by the road-side. Mr. Dawson happening along saw these and was told of the cocoanut. He recovered the fragments and pieced them together to find that they formed the left half of a human skull. Subsequent search succeeded in bringing to light a fragment of the tooth of a mastodon; various fragments of the teeth of a prehistoric elephant, together with those of a hippopotamus, a beaver, and an extinct horse; a bit of a large deer's antler; and, finally, a fossilized jaw-bone which is presumed to belong to the same skull.

The gravel bed in which these remains were found represents a deposit made by the slow wearing away of chalky rocks in which the insoluble flint was originally embedded. Thus, erosion would bring together in the gravel deposit the remains of different periods if any such existed. It is the opinion, however, of Sir Ray Lankester and others that the remains are contemporary.

The place of this ancient ancestor in the roots of our family tree may be determined by a study of certain geological and anthropological factors. Geology recognizes four principal epochs in the development of terrestrial life.

EPOCHS	CHARACTERIZED BY
Primary or Palæozoic.	Seaweeds, ferns, and fishes.
Secondary or Mesozoic.	Conifers and reptiles.
Tertiary or Cainozoic.	Leaf-bearing trees and mammals.
Quaternary or Post-Tertiary.	Present existing species.

The last two periods are subdivided as follows:

Tertiary
- Eocene.
- Oligocene.
- Miocene.
- Pliocene.

Quaternary
- Pleistocene.
- Prehistoric and Recent.

The Eocene strata contain the earliest known mammalian types, while the earliest anthropoid apes are found in Miocene deposits. The life history of the human race will not, therefore, reach further back than the Miocene period.

Geography, climate, flora and fauna are important factors in the determination of ancestral place. If one could suddenly be transported to Sussex, and the wheels of time be as suddenly turned backward a million or more of years to Miocene and Pliocene times, he would be surprised at the strange outlines presented by the map of Europe and of England in particular. At that remote period the waves of the Atlantic washed upon a shore far to the west of the British Isles, which is now submerged beneath one hundred fathoms of water. The Irish Sea, the German Ocean, and the English Channel were then fertile valleys. The Thames flowed northward into the Rhine and finally into the Atlantic; while the Seine flowed westward along the now southern coast of Sussex, out through the fertile plains of the English Channel till it emptied into the Atlantic a hundred miles west of Land's End. In place of the Mediterranean were two inland seas separated by an isthmus which extended from Europe into Africa along the line of Italy and Sicily. The animals that inhabited the African jungles could thus cross into southern Europe and wander through the valleys of the Thames and Seine. Indeed, a traveler thus transported might well imagine that he stood in the midst of a great out-door menagerie. There were the huge proboscideans, the colossal Mastodon, and the Deinotherium, the latter having great tusks curving downward from the lower jaw. In the swamps he might be startled by the rush of the soft-nosed rhinoceros, which bore a horn sometimes three feet in length. Over the hills dash herds of wild horses about the size of sheep. The hippopotamus disports himself in the rivers while the formidable saber-toothed tiger steals through the tropical flora in pursuit of his victim.

"Tropical flora"—not merely a rhetorical figure, for at that time water-lilies grew within eight degrees of the Pole. North Greenland had a flora of one hundred and thirty-seven described species, including conifers, beeches, oaks, planes, poplars, maples, walnuts, limes, and magnolias. But toward the end of the Pliocene period the gradual cooling of the climate which resulted in Pleistocene times, in the great Ice Age, caused the apes and many other mammals to seek a more southern habitat.

The "Cromer Forest-Bed" of Norfolk, England, is a late Pliocene deposit and gives a fair idea of the flora and fauna of its time. There are fifty-six varieties of flowering plants, the range of which indicates a mild and moist climate not unlike the England of to-day. Among the trees are the maple, hawthorn, elm, beech, birch, alder, hazel, oak, willow, yew, pine, and spruce. The fauna consists of species not so well known now. In fact, of the thirty large mammals found in the Forest-Bed only three are now living in Britain, and only six have survived in any part of the world. There were three species of elephants, the hippopotamus, rhinoceros, two types of horses one of which is now extinct, the bison, and the wild boar. Some flints bearing evidence of human workmanship were found here by Mr. W. J. L. Abbott in 1897. Altogether the stratified series, fauna and flints of the man of Sussex indicate that he represents approximately the same period as that of the Forest-Bed.

To state these periods in terms of years is admittedly very unsatisfactory. Geologists show the widest variation in their estimates. Nor does the evidence offered by the anthropologist remove many obstacles, but tends, rather, to make the problem more complex. Nevertheless, we are accustomed to think of time in terms of years, centuries, and millennia, and such estimates may at least encourage the imagination in a field where, undoubtedly, our greatest error is in falling short of, rather than over-reaching, reality. The figures used are those given by Mr. Arthur Keith, Conservator of the Museum, Royal College of Surgeons, England, in his recently published *Ancient Types of Man.* His estimate occupies a conservative middle ground among those commonly given.

Beginning with the present time and counting backward, the Metallic Period, characterized by the use of copper, bronze, and iron, extends over a period of about four thousand years. This was preceded by an age in which finely polished stone implements were used. The Neolithic Period covered a stretch of at least twenty-five thousand years. Beyond the Neolithic we enter the Late Paleolithic, which extends over a period of one hundred and fifty thousand years to the end of the Glacial Age, and falls within the latter part of the geologists' Pleistocene Period. During this time man obtained mastery over stone. He learned to chip it with precision, forming implements that are notable both for their artistic beauty and their usefulness. The Early Paleolithic Period is estimated at anywhere from two hundred thousand to four hundred thousand years, and is characterized by crude stone implements. Beyond this for one hundred thousand to one hundred and fifty thousand years stretches the Eolithic Period, the dawn of the Stone Age. It is a vague and indistinct period for there is always a degree of uncertainty as to the evidences of human workmanship in chipping the flints. As the flint implements of this period were extremely primitive, it is an open question concerning most of the so-called " eoliths " as to whether Nature herself was not the great artificer. This is almost certainly the case with those flints found in the Upper Oligocene strata at Thenay, France. The period is too early for man, unless we suppose with G. De Mortillet that they represent the work of a semi-human precursor of both the apes and man. At this period the ancestral horse was a small-three-toed animal about eighteen inches high, and the ancestral elephant about the size of a pig. Moreover, chipped flints have been recently found in Lower Eocene sands at Belle Assize by the Abbé Breuil, which clearly showed that they owed their formation to movements of the strata settling under pressure of the upper earth. Some of these present an astonishing resemblance to the artificially formed " eoliths."

But whatever the doubts may be, it is rationally certain that long before the first crude stone implements, which clearly reveal human craftsmanship, were made, man had come to realize the necessity for some sharp-edged implements, and when nature failed to provide these he was slowly developing the art of producing them.

The stone implements and flints found in connection with the Sussex man belong to two different stages of culture. One series of flints are of " eolithic " origin, the other is attributed to the "Chellean" stage, one of the Lower Paleolithic phases of development. The principal Chellean implement was a coarsely dressed piece of flint chipped on both sides to an irregular but sharp edge, and fitted for grasping in the hand without any shaft. It might be used either for scraping or cutting, and in the hands of this powerful creature who first fashioned it, would undoubtedly prove a formidable weapon. This weapon, for which Professor W. J. Sollas, of Oxford, proposes the name "boucher" in honor of its discoverer Boucher de Perthes, is the most common of the Chellean implements, being frequently the sole representative of the period. But the presence of such an implement does not of itself indicate the period at which it was used. The "boucher" held prominent place among the implements used in recent times by the Tasmanians. The presence of Chellean implements in the gravel in which the Sussex skull was found may be accounted for in a number of ways. The "eoliths" found in the same gravel are more in harmony with the strata and fauna both of which indicate a period earlier than that of Chellean man.

Summing up the figures given above the Eolithic and Paleolithic Periods of the anthropologist correspond roughly to the Pleistocene of the geologist, except that the Eolithic Period probably reaches farther back into the Pliocene times. The duration of the Pleistocene Period is estimated, by this count, at from four hundred and fifty thousand to seven hundred thousand years. Regarding the Sussex man as representing either Pliocene or the transition from it to Pleistocene times, would therefore fix his time at not less than five hundred thousand years ago.

Some comparisons between this skull and those of other ancient men are of interest. As a basis for such comparison, the cranial capacities of various modern races, representing so many stages from degeneracy to culture, are estimated as follows:

European	94	cubic	inches.
Negro	85	"	"
South African Bushman	78	"	"
Tasmanian	73	"	"
Australian Aborigine	72	"	"

The cranial capacity of the anthropoid apes is not known to exceed thirty-six cubic inches.

The celebrated Neanderthal man was discovered in 1857 in a Pleistocene bed in Feldhofen Cave, Neanderthal ravine, in Rhenish Prussia. The remains consisted of the brain cap, two femora, two humeri, and other fragments. Huxley pronounced the skull the most ape-like yet discovered, and estimated the cranial capacity at seventy-five cubic inches. This has since been disputed by Manouvrier and Boule, who estimate it to be equal to that of the average European of to-day. When these specimens were first exhibited before a meeting of German anthropologists at Bonn, their human character was doubted. Later the great anatomist, Virchow, expressed the opinion that the small size and peculiar shape of the brain cap were due to disease. Subsequent discoveries, however, show the Neanderthal man to have been a member of a race well distributed throughout Europe during the Glacial Period. Two almost complete skeletons which were recovered from the floor of a cave at Spy, Belgium; two others from Le Moustier and La Chapelle-aux-Saints; various fragments representing a dozen or more individuals from Krapina in Croatia; the Gibraltar cranium, which was discovered nine years before the Neanderthal remains; and the famous Heidelberg jaw, are among the remains that testify to the Neanderthal race. The implements found in connection with these remains serve to classify them as "Mousterien," a Middle Paleolithic stage. The Chellean "boucher" has given place to better prepared implements and also to a greater variety.

The Heidelberg jaw, probably the earliest trace of Neanderthal man, was found in 1907 in the valley of the Neckar, about six miles from the famous university town whose name it bears. It lay embedded in the sands of the ancient river Mauer, which are an early Pleistocene formation. In the same layer were found some bones and teeth of an extinct rhinoceros and an early kind of horse. The fauna is very similar to that of the Cromer Forest-Bed. While only the mandible of this ancient man was found, yet no single bone can reveal more concerning the body to which it belongs than a mandible. There is a striking resemblance between this Heidelberg jaw and that of the Sussex man, the latter, if anything, being the more primitive. The Sussex jaw is not quite complete, a portion of the front of the chin together with the incisors and canines being absent. But both these jaws show the absence of a chin, or, in other words, they indicate a protruding muzzle as in the case of the anthropoid apes. While the dentition in each case is distinctly human, the massive body and broad ascending branches are as distinctively simian.

The free movements of the tongue in speech have been provided for in the existing races of man by a greater opening in the lower part of the jaw which bounds the floor of the mouth at its anterior extremity. The square chin allows the inner surface of the jaw to slope steeply downward from the back of the incisors. In the anthropoids this lingual basin is much encroached upon, the slope of the inner surface of the jaw being more gradual. In this respect both these ancient mandibles show an intermediate stage between man and the anthropoids. The jaw of the anthropoid is designed to serve simply the purpose of mastication. That of the human is modified to serve also in speech. In both these prehistoric men human speech of a primitive type may have been present, but we have reached a point in the development of the race where it may be said to be questionable.

The incompleteness of the Sussex skull renders estimates of the cranial capacity difficult, but it undoubtedly falls between sixty-two and sixty-seven cubic inches. Professor Keith attempts to reconstruct the whole head of the Heidelberg man on the basis of facts revealed by the mandible, and concludes that the cranial capacity was not less than one thousand three hundred cubic centimeters, or about seventy-eight cubic inches. Allowing for all possible inaccuracies in these figures, the man of Sussex shows smaller cranial capacity than that of any other European remains thus far discovered. In this respect he also represents a more primitive type of man than any existing race. But there is one other ancient man who probably antedated the Sussex man by as long a period as that between the latter and the Neanderthal race.

In 1891 and '92, Dr. Eugène Dubois, Professor of Geology at the University of Amsterdam, uncovered on the bank of a stream in central Java the bones of twenty-seven species of mammals. Among these were a skull-cap, thighbone, and two molars, which he assigned to an extinct animal type and named it *Pithecanthropus erectus* (Erect Manape). In general form and scientific detail, clear only to the trained eye of the anatomist and anthropologist, this skull-cap is more simian than human. The forehead is more receding than that of the chimpanzee. The height of skull, according to Keith, is only seventy-nine millimeters, twenty millimeters less than that of the modern European, and only thirteen millimeters more than that of the male gorilla. Professor Dubois estimates the cranial capacity of the Java man as eight hundred and fifty cubic centimeters, or about fifty-two cubic inches. It must be remembered, however, that the skull is far too incomplete for exact measurement. If the above measurements are correct, the Java man occupies a position, in this respect, midway between the anthropoid apes and the lowest existing races of men. There seems to be a striking concurrence here between the figures of Keith and those of Dubois, and the former believes that the time of the Java man was near the beginning of the Pliocene Period.

Arranging these remains of prehistoric man in order of age, the Java man would occupy first place at not less than a million years antiquity. Next would come the Sussex man as the oldest European yet found. As the Java man forms a link midway between man and the apes, so the Sussex man forms a no less important link between *Pithecanthropus* and modern man, while the gap between the man of Sussex and our own times is filled first by the Heidelberg man and then by the other Neanderthal representatives.

These occasional discoveries are forging link by link the living chain that connects us with the remote past. They indicate that back in Miocene times the parent stock began to differentiate into those two great lines which are to-day so far apart, man and the man-like apes. The advance of man has required not years, but millennia. We rise from a stooping posture without a thought of how our distant ancestors through the advance of ages untold, gradually attained the erect posture. We light our fires with a chemically prepared stick costing a penny a box, and value not the priceless gift of Prometheus. But the erect posture, the use of fire, the development of speech, the fashioning of crude implements, the taming of the wild horse, and the reproduction at will of the wild plants, are milestones along the pathway of progress which dimly and vaguely indicate the distance man has come.

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